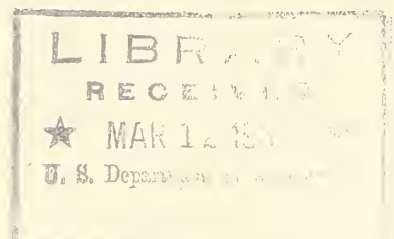


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MAN'S RESPONSIBILITY FOR DROUGHTS

A radio talk by J. B. Kincer, Weather Bureau broadcast in the Department of Agriculture period, National Farm and Home Hour, Thursday, February 21, 1935, by NBC and a network of 50 associated radio stations.

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During the past year the United States experienced the most disastrous drought in its history. This naturally has attracted much attention to the matter of rainfall and just what it is in Nature that produces droughts of this character. Questions frequently asked are-- "Is any physical act of man responsible for the shortage of rainfall experienced last year, and can he do anything to change existing conditions and avert calamities such as the 1934 drought produced?"

In considering the matter, it may be pointed out at the beginning that drought has been man's relentless enemy down through the ages. The earliest historic reference to periodic deficiencies in rainfall is found in the Bible where we are told of years of plenty followed by successive years of famine. Thus, we see that recurring, disastrous droughts are not a product of the twentieth century, as some apparently think, but are as old as time itself. They are most likely to occur, however, in areas having normally scanty precipitation.

For an understanding of the 1934 drought, it is necessary to state that weather, such as rainfall, has a habit of occurring in groups of years having rather similar conditions. There is a tendency for several years in succession to have above normal rainfall, to be followed by a group of years tending to below normal, with danger of widespread harmful droughts. In years when rainfall is near normal the matter attracts but little attention. However, periods with abnormalities, either a succession of years with comparatively abundant precipitation or a group with serious deficiencies attracts attention, and many theories are proposed as to the causes of the abnormalities. For example, in our great western Plains, from about 1900 to 1915, there was comparatively abundant moisture with most of the years having above normal rainfall. Now, during this period, there was a very large increase in the cultivated land, due largely to the fact that there was ample moisture, but many people thought and argued that the favorable condition was caused by the cultivation of the land. The Weather Bureau did not subscribe to this theory, and a paper was published entitled "Cultivation Does Not Increase the Rainfall". The Bureau at the time gave warning that these conditions were only temporary and that drought years were sure to follow.

As expected, after this period of heavy rainfall, the pendulum swung back, so to speak, culminating in the disastrous drought of 1934. Just as man in the first case was credited with bringing about the generally favorable conditions, he is now blamed by many for the more recent occurrence of drought. The facts are he has practically nothing to do with the matter of rainfall in either case, though the very thing, extensive cultivation, for which he was earlier given credit for effecting an apparently favorable change in climate, is now known to have contributed very materially to the 1934 disaster, through soil erosion and extensive dust storms.

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Many theories are advanced as to the cause of the drought. One frequently heard is extensive radio broadcasting; another is the drainage of small lakes, ponds, marshes, and the like. Many others are too silly even to mention. It is definitely known that radio waves have no influence whatever on atmospheric pressure conditions, nor on the temperature, and, consequently, they could not possibly affect condensation, the major factor in producing rainfall. Moreover, severe droughts occurred many years before the radio was even thought of.

The drainage theory, sponsored by a good many thinking people, requires more deliberate consideration. On its face this appears logical and convincing. It is argued that, with the destruction of thousands of square miles of water surface, there, obviously, is less moisture contributed to the atmosphere through evaporation, and, consequently, less to condense and precipitate as rain. To the layman this appears all sufficient, but to the Meteorologist it is far from convincing. Two fundamentals are necessary to produce rain. First - Water must be gotten into the air by evaporation from moist surfaces and transpiration through the leaves of growing trees and plants; and, Second - the invisible water vapor thus supplied must be condensed into liquid form as rain drops. While getting moisture into the air is, of course, necessary, the drainage theory as a cause of drought overestimates the importance of this phase of the problem. Many seem to think that all that is required to produce rain is to supply the air (more correctly speaking space) with sufficient moisture. The second phase, however, is by far the more important. In other words, there is nearly always enough moisture present in the atmosphere to produce rain in substantial amounts whenever the machinery of Nature's rain factory is operating in a manner to cause sufficient condensation.

There is abundant evidence to support this statement. For example, in parts of southwest Africa, even in coastal sections, the average rainfall is less than one inch a year, yet the adjoining Atlantic Ocean is one of the largest bodies of water in the world, affording abundant opportunity for an ample supply of atmospheric moisture. In southern California, in July, there is as much moisture in the air as in central New England, yet rain rarely occurs in California during this month, but usually is comparatively abundant in New England, being on the average more than a hundred times greater than in southern California. Minnesota is dotted with small lakes, yet Iowa, hard by, with very few lakes, has, on the average, 25 percent more rainfall in a year than has Minnesota. Again, Michigan is nearly surrounded by large bodies of water, while Indiana, adjoining, with less than one half of one percent of the total surface water, has an average of 30 percent more rainfall.

More specifically, in western Arkansas, April, 1934, had above normal rainfall, but July had only fifteen hundredths of an inch, or 4 percent of normal, yet July actually had 86 percent more atmospheric moisture than April, as shown by the humidity records made by the Weather Bureau at Fort Smith, a representative station. Obviously, the severe July drought in western Arkansas was not due to a lack of moisture in the atmosphere.

Many other just as convincing examples might be given, but these are sufficient to establish, beyond doubt, the fact that the primary agency in producing rainfall is not local water surfaces, such as ponds, and the like,

but rather the physical atmospheric operations (air mass movements) through which the moisture present is condensed and made available as rainfall. The only effective method of producing rain is through the cooling of the air in volume and degree sufficient to extract from it a goodly portion of its valuable water treasure hidden in vapor form. Nature effects this cooling in a number of ways and usually on an immense scale, far greater than man could ever hope to emulate. Air moves from place to place over the earth's surface in mass formation. These masses are of two major sources - polar and tropical; those of polar origin are dense, heavy, and relatively cold, and those of tropical inception warmer and lighter. A mass of tropical origin moving northward may come in contact with a polar mass, and, being lighter, it naturally flows up over the opposing dense air, just as it would flow up the side of a mountain that might, by chance, be disposed in its path. In its ascent, through expansion, the cooling necessary to produce rain is effected. This illustrates Nature's method of producing rain in appreciable amounts; no other is effective. We regret that time will not permit of a further discussion of the interesting operations of Nature's rain factory.

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